A FRAMEWORK TO INVESTIGATE THE FINANCING OF SUSTAINABLE CITIES IN SOUTH AFRICA

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Abstract- South African cities are predominantly maintained and developed in the form of conventional infrastructure and the associated conventional funding thereof. The promotion of sustainable practices in urban development is not necessarily coupled with alternative or sustainable forms of financing. Although the public sector will always remain the key initiator behind infrastructure development, various mechanisms of financing, along with applicable financing partners and the basis of investment, will be required so as to address future sustainable cities. This paper proposes a framework to investigate the financing of sustainable cities in South Africa.

Keywords- Financing, framework, sustainable cities

I. INTRODUCTION

The United Nations General Assembly's [1] resolution stipulates a common vision for the future wherein economic, social and environmental aspects are mainstreamed at all levels so as to achieve sustainable development. This resolution recognises that the need to achieve sustainable development is obtained by promoting sustained, inclusive and equitable economic growth, raising basic standards of living, promoting the integrated and sustainable management of natural resources and ecosystems and fostering equitable social development [1]. These factors are inherently associated with population growth along with the subsequent accommodation of that growth within urban centres.

Although directives exist with respect to promoting sustainable development, financial strategies to cater for collective sustainable development, along with an increasing population, need to be formulated relevant to metropolitan and urban areas. As urban economic output and energy needs increase, urban areas will increasingly need to invest in infrastructure to ensure sustainable and eco-friendly solutions [2].

Furthermore, the Organisation for Economic Co-operation and Development (OECD) estimates that 3.5% of the global GDP is required to be invested in basic infrastructure so as to cater for future population growth whilst simultaneously bearing the cost of minimising impacts on the environment [3].

Key to the required investment in infrastructure is who will assume the costs and direction thereof? Although the public sector will always remain the key initiator behind infrastructure development, various mechanisms of financing, along with applicable financing partners and the basis of investment, will be required so as to address future sustainable cities. This paper seeks to develop a framework to investigate the financing of sustainable cities in South Africa.

II. PREVIOUS STUDIES WITH RESPECT TO THE GREEN ECONOMY AND CITY FINANCES

Sustainable development became the primary goal of the international community since the UN Conference on Environment and Development in 1992 [4]. The term green economy was first tabled in 1989 in a report for United Kingdom government by environmental economists [5]. The report sought to determine whether there was consensus on the term 'sustainable development' along with the implications of sustainable development for the measurement of economic progress [5]. In 2008 the 'green economy' term was revived in the context of policy response to the multiple global crises [5]. The United Nations Environment Programme championed the concept of green stimulus packages where large scale investment could initiate a green economy [5]. Respective governments followed suit in attempting to implement green stimulus packages as part of economic recovery efforts. In Africa, and more specifically South Africa, numerous research themes have been developed with respect to the green economy. Previous studies with respect to the green economy and city finances includes:

- Africa. Swilling [6] states that the global economic crisis will only cease once finance capital has been disciplined and once green technology driven by finance capital is heightened. The challenge is that despite the potential in green technology there is a lack of high risk investments that are needed to go beyond niche markets. Focus on Private sector investments is lacking.
- Provincial Context, South Africa. The Strategy for a Developmental Green Economy for Gauteng [7] advocates the need to introduce a green low carbon economy. It further advocates the need to realign economies on long term sustainability thereby resulting in a shift of capital focussed investment to strategic investments in knowledge capital and

innovation systems. Focus on strategic Investments in innovation systems

- South African Cities. The State of City Finances Report [8], as applicable to South African cities, states that the performance of a city is a measure of their contribution to sustainable development. The Report further elaborates that due to a city's financial capital along with its focus on infrastructure and services, great potential exists with respect to mobilising the green economy. Focus on Innovative financing mechanisms As shown key themes with respect to research surrounding the green economy and city finances include:
- The private sector and alternative forms of funding will be required in the future with respect to the financing of sustainable cities;
- Natural resources need to be utilised efficiently; and
- Frameworks are required that harness the potential for investment into environmentally friendly activities.

III. FINANCING METHODS FOR SUSTAINABLE CITY DEVELOPMENT

No single city development financing method can claim to ensure the sustainable development of cities [9]. Furthermore, as Gunningham [10] states, a range of policies and interventions is required as part of a financing policy mix however this is dependent on a country's potential energy sources, technological capabilities, economic circumstances along with the political, economic and social constraints within which decisions need to be taken. Given South Africa's existing political, economic and social context, this study seeks to investigate potential financing methods so as to ensure the future development of sustainable cities. Included within these financing methods are instruments such as crowd funding, alternative forms of property rating based on renewable energy technologies, trading schemes, capital subsidies for sustainable city development, public-private partnerships and government funding leverage so as to encourage private sector financing amongst other financing strategies. Key to the eventual financing model is the context of the South African city and what components form the structure of a sustainable city. In addition, the outsourcing of future city infrastructure and services is likely to increase in the future [11]. The outsourcing of city infrastructure and services is coupled with alternative funding strategies as the size of the State in the economy reduces.

Future city development, given increased population growth and the associated need to eradicate poverty, is an inevitable occurrence within the South African context. However as Swilling [12] states, the challenge exists in reconciling development within a limit to growth mentality ensuring that developing countries do not replicate unsustainable systems as within the developed world. As cities continue to grow increased demands on water, energy, food, land and building material provision will continue unabated producing unprecedented quantities of waste. In addition cities previously constructed in South Africa were built on the assumption that there was cheap coal-based energy, unlimited supplies of water, low fuel costs, unlimited provision to cater for the disposal of waste and unlimited supplies of land [12]. These assumptions cannot apply to modern day South Africa. As such Swilling [12] states that the following issues need to be addressed so as to ensure that future development occurs in a sustainable manner thereby integrating equity and urban economic growth.

- Reducing the total consumption of water along with the dependence on large scale water capture systems;
- Encouraging a community based sanitation system for all income groups where sewerage is treated and re-used;
- Promoting densification, mixed land use and mixed income residential areas;
- Reducing the use of private vehicles whilst simultaneously increasing the use of public transport;
- Reducing the use of fossil fuel based energy leading to a transition of energy provision that utilises a combination of solar, wind, micro-hydro and hydrogen power couples with increased efficiencies;
- Increasing food supplies from urban farms along with building local food retail markets;
- The separation at source of solid waste couples with collection and recycling systems;
- Ensuring that building materials and design are based on the assessment of the environmental and social impact;
- A reduction in air pollution and CO^2 emissions from vehicles, utilities and homes;
- A public health system that focuses on the provision of basic services;
- Increased biodiversity and recreational space; and
- Enhancing child centred development and learning.

As urban sprawl continues, governments are in dire need of intervention strategies to foster urban development by means of eco-efficient strategies and social inclusiveness [13]. As such multiple pathways are required in making cities more sustainable through large scale investment programmes to bottom up interventions such as shifts in behavior [14].

Although mechanisms exist so as to ensure an adequate basis of investment, key to future sustainable development is the recognition that multiple visions of sustainable city development, from the built and the natural environment through to the concept of social equity, converge. This has implications for the financing thereof. As stated by Swilling [12] an alternative approach to local economic development in developing country cities is required so as to target sectors for investment where the potential for poverty reduction is the greatest. Typical current local

economic development interventions within South Africa are arguably focused within the sectors of tourism and urban agriculture. Little to no opportunities are sought from the re-engineering of water, sanitation, land, energy and food systems. Nor are preventable leakages from the local economy sought with respect to purchasing less water from outside the local economy and utilising less disposable income of households on energy for example [12]. The eventual financing mechanisms of sustainable cities should seek to ensure that social equity convergence is core to the financing strategy. Given the extent of the sustainable interventions required within the development of a city, a combination of financing mechanisms are required to fund future sustainable city development rather than predominantly rely on inter-governmental fiscal transfers. An over reliance on inter-governmental fiscal funding does not necessarily conform to the principle of sustainable finance. As such varying mechanisms of financing a sustainable city, based on sector specific characteristics along with social parameters, should ideally be applied. Crowd sourcing for example, could potentially be used as a mechanism to address an issue within the future development of a sustainable city. As Sundic and Leitner [15] state, crowd sourcing has proven to be an innovative strategy and furthermore a business model in establishing innovation platforms not to mention the versatility thereof. These innovative platforms can potentially be used through bottom up interventions that result in shifts in behaviour along with an opportunity for alternative funding mechanisms. The same could be said of alternative forms of property rating based on renewable energy technologies, trading schemes, capital subsidies for sustainable city development, public-private partnerships and government funding leverage. Practices such as property taxes, borrowings to finance capital expenditure, crowd funding, public private partnerships, renewable technologies and social re-engineering, should therefore be structured in such a way so as to ensure that future development occurs in a sustainable manner thereby integrating equity and urban economic growth [12] through:

- Reducing the total consumption of water along with the dependence on large scale water capture systems;
- Encouraging a community based sanitation system for all income groups where sewerage is treated and re-used;
- Promoting densification, mixed land use and mixed income residential areas;
- Reducing the use of private vehicles whilst simultaneously increasing the use of public transport;
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- A public health system that focuses on the provision of basic services;
- Increased biodiversity and recreational space; and
- Enhancing child centred development and learning.

III. DETERMINE THE COMPONENTS AND SUB-COMPONENTS OF A SUSTAINABLE CITY FRAMEWORK

Given the four factors of the future sustainable development of cities, determining an adequate basis of investment for future development, converging the multiple visions of sustainable development along with coupling financing mechanisms to fund these multiple visions it is, for the purposes of this study, important to understand the following.

- The measurement of urban sustainability;
- Investment in natural capital;
- Social equity;
- Community driven, managed and owned infrastructure; and
- Shortfalls in municipal budgeting and financing.

A. The measurement of urban sustainability

Although Swilling [12] has identified issues that need to be addressed so as to ensure that future development occurs in a sustainable manner thereby integrating equity and urban economic growth, a mechanism of measurement is required so as to ensure the appropriate attainment of those issues. For example, Ratas and Maeltesemess [16] detail criteria used in the European Green Capital Award which seeks to recognise cities' efforts in valuing environmental protection activities along with their efforts in creating a harmonious urban environment.

B. Investment in natural capital

Many of the components that will form the basis of measuring sustainability reflect a reliance on natural capital. The value of natural capital is however difficult to define. As Constantinescu [17] states, two common errors occur with respect to the value of natural capital. The first error relates to the attempt to define natural capital in monetary terms only thereby ignoring the value of natural capital in making sustainability simpler. The second error relates to assessing natural capital in terms of goods and services provided by nature whose market value can be easily determined at the exclusion of those goods and services whose value cannot be easily determined.

There are four strategies with respect to natural capital investment, namely innovations in private investment, jurisdictional boundaries, government funding and community based ecosystem management [18]. These four strategies serve as a basis of staying true to environmental and community values. Innovations in private investment [18] include:

- Third party certification of sustainability measures: Independent third-party certification has become a viable market based financial tool to fund ecosystem management;
- Carbon sequestration leverage packages: Involves the accumulation of carbon in terrestrial forms thereby limiting greenhouse gas build up;
- Resource banks: Refers to trading natural asset value for use thereby attempting to ensure the balance between the need for natural assets and monetary value;
- Partnership financing: Involves major corporation financing of sustainability practices and certification; and
- Technology and new markets leveraging: Involves the identification and implementation of new technologies and markets to match buyers with resources generated from sustainable ecosystem management.

Innovations in jurisdictional boundaries include the creation of mechanisms that allow for the use and need of ecosystem services regardless of jurisdictional boundaries. This is achieved through fiscal / ecological zoning where natural areas are specifically zoned so as to attract commercial activity that generates revenue for the locality.

Innovations in the government funding of ecosystem management relates to altering the perspective where ecosystem finance is viewed as an investment issue as opposed to an administrative or budgetary problem.

Innovative community based ecosystem management relates to the fundamental concept that communities are central to solving the ecosystem investment problem as they are best placed to capture and reinvest in the resulting benefits to sustain ecological improvements.

C. Social equity

Financing mechanisms of sustainable cities should seek to ensure that social equity convergence is core to the financing strategy. Equity does not refer to equality but rather refers to instances in which a community is treated fairly but not necessarily the same thereby ensuring that all benefit from the prosperity of a sustainable city [19]. Urban equity within the context of development means that public goods and services should be available to everyone thereby resulting in an environment where the goods and services are distributed to all according to needs [19]. Furthermore, measures are put in place for a fair and more efficient use of resources, skills and opportunities so as to promote equal outcomes for al [19]. This complies with the intended core of this study where proposed financing mechanisms seek to fund the sustainable interventions whilst integrating equity and urban economic growth. These sustainable interventions within city development are as follows:

- Reduce the total consumption of water along with the dependence on large scale water capture systems;
- Encourage a community based sanitation system for all income groups where sewerage is treated and re-used;
- Promote densification, mixed land use and mixed income residential areas;
- Reduce the use of private vehicles whilst simultaneously increasing the use of public transport;
- Reduce the use of fossil fuel based energy leading to a transition of energy provision that utilises a combination of solar, wind, micro-hydro and hydrogen power couples with increased efficiencies;
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- Ensure that building materials and design are based on the assessment of the environmental and social impact;
- Reduce in air pollution and CO^2 emissions from vehicles, utilities and homes;
- Instil a public health system that focuses on the provision of basic services;
- Increase biodiversity and recreational space; and
- Enhance child centred development and learning.

As Phimphanthavong [20] states, sustainable development is a combination of economic growth, social development and environmental protection under the premise that economic growth is distributed to the entire population through the reduction of poverty and the minimisation of inequality whilst maintaining our natural resources. Sustainable development further involves all sectors including education and health improvement, sanitation system extension, poverty reduction and the promotion of natural resource protection. The primary principle of sustainable city development is that all of the above factors interact in decision making [20]. A financing strategy for sustainable city development therefore needs to be developed and exist within a cross section of sustainability interventions that contribute to overall city sustainability.

D. Community driven, managed and owned infrastructure

Coupled with social equity, key to a financing strategy to fund sustainable city development is that of

community participation within city development. True community participation seeks to provide equal opportunities amongst the community to share ideas and needs with the objective being to ensuring increased capacity and awareness of the local population that could be utilised for the future development of their communities [20]. As such various mechanisms of financing sustainable city development that will be proposed in the study, should seek social equity and community involvement. The primary objective of appropriate community involvement is to increase capacity and awareness of the local population in the future development of their communities. This is achieved where a community has a direct stake in future sustainable development which harnesses a will to participate and contribute to the future development of their communities. More specifically, stakeholder connectivity in infrastructure capacity management within a community is made up of two key constructs namely collaborative relationships and knowledge sharing along with the impact on organisational or municipal performance [21]. Appreciating the value of stakeholder connectivity in adding value to infrastructure capacity management can lead to the development of new solutions by exploiting existing opportunities [21]. This is key to any financing strategy for sustainable city development. Approaching the financing of sustainable city development through traditional private sector project financing methods where the developer remains incentivised to increase their return on investment results in the marginalisation of the community [22]. The project financing of sustainable development needs to include the meaningful participation of all affected parties thereby preserving the ecological heritage of communities in which development takes place [22].

E. Municipal budgeting and financing

In order to green the economy public budgets alone will not be able to provide the necessary financial resources. Additional resources need to be mobilised particular with respect to green investments in developing countries and emerging markets [23]. As such governments may make use of public instruments so as to leverage capital for sustainable city development. Additional financial resources can be grouped into three categories which seek to leverage capital for sustainable investment [23]. These include:

- Instruments that primarily provide funding to projects;
- Instruments that transfer knowledge or risk; and
- Instruments that raise additional private funds.

These additional financial resources have different advantages and weaknesses and are dependent on country circumstances. As such a mix of approaches needs to be applied within varying countries, however the potential for mainstreaming green finance and utilising the additional financial resources on a larger scale is relatively limited [23]. As knowledge on the effectiveness along with the implications of green finance is incomplete, Lindenberg [23] proposes the following policy recommendations.

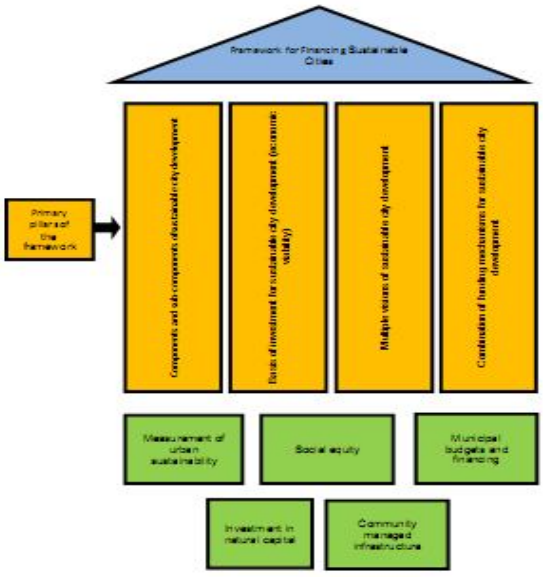
- Greater knowledge is required with respect to green finance with respect to current financing arrangements;
- Governments should bear in mind that green investments do not always require financing but rather a conducive environment;
- Whatever form of green financing is utilised, it must be simple to understand; and
- Governments should utilise all of the various instruments to leverage private capital due to the usefulness for different purposes, project phases and situations.

IV. A BRIEF OVERVIEW OF THE FRAMEWORK

The literature overview shows that there are four primary pillars that will form the basis for a framework for financing sustainable cities, namely the components and sub-components of sustainable city development, the economic viability of sustainable city development, the multiple visions of sustainable city development along with the mechanism of funding for sustainable city development.
The primary informants to the four pillars include the concepts of measuring urban sustainability, investment in natural capital, social equity, community managed infrastructure along with municipal budgets and financing.

Figure 1 outlines the four pillars that can be included in a framework to investigate the financing of sustainable cities.

Figure 1: Framework to investigate sustainable cities



Source: Author's own compilation

The pillars as depicted in Figure 1 represent the core components for a framework for financing sustainable cities underpinned by the five elements of sustainable city development.

CONCLUSIONS AND RECOMMENDATIONS

South African cities are predominantly maintained and developed in the form of conventional infrastructure and the associated conventional funding thereof. This includes national government grants and the local tax base. The promotion of sustainable practices in urban development is not necessarily coupled with alternative or sustainable forms of financing. Nor is a collective foundation of investment fostered and pursued. This study seeks to present an approach to sustainable development that is underpinned by three key elements namely, defining the delivery mechanisms of sustainable development, providing a basis of investment for future development as a precursor for future sustainable development and ultimately financing that sustainable development from initiation through to development and maintenance. As such this study will seek to present an inclusive approach to sustainable city development that not only focuses on the delivery of a service but also the feasibility of initiating that service along with the subsequent financing and development thereof. As a result, this could assist local government, private developers, communities and investors in the formulation of instruments and financing mechanisms so as to fund sustainable city development. An alternative perspective on sustainable financing will thus be provided.

REFERENCES

[1] United Nations General Assembly, The future we want, Resolution adopted by the General Assembly on 27 July 2012. 66/288, 2012.

[2] Siemens White Paper on Sustainable Cities, Trends, Investment Challenges & Financing Solutions, A Research Report from Siemens Financial Service,Siemens Financial Services, 2010.

[3] R.W.Chalones-Browne," Sustainable Cities: New Avenues for Financing". Environmental Leader [online] available at: www.environmentalleader.com/2011/05/24/sustainable-cities-new-avenues-for-financing/ 2011.

[4] Agenda 21, United Nations Sustainable Development, Agenda 21, United Nations Conference on Environment and Development.United Nations Sustainable Development, Rio de Janerio, Brazil, 3 to 14 June 1992.

[5] Guidebook to the Green Economy,"Division for Sustainable Development", United Nations, UNDESA, 2012.

[6] Swilling, M. "Economic Crises, Long Waves and the Sustainability Transition: An African Perspective", Environmental Innovation and Societal Transitions, vol 6, pp. 96-115, 2013.

[7] Strategy for a Developmental Green Economy for Gauteng,"Report prepared for the Gauteng Province Department of Economic Development", Gauteng Department of Economic Development, Johannesburg, 2010.

[8] State of City Finances, Towards Sustainable Municipal Finances, South African Cities Network, Johannesburg, 2013.

[9] World Economic and Social Survey,"Report published by the United Nations", 2013.

[10]N. Gunningham, "CEGNet Working Paper", no. 29. Regulatory Institutions Network, 2014.

[11]E. ossa, G.Spagnolo &M. Velleze, "The Risks and Tricks in Public-Private Partnerships", The Center for Research on Energy and Environmental Economics and Policy, Working Paper nr. 64,The Center for Research on Energy and Environmental Economics and Policy, Bocconi University, Milan, 2013.

[12]M. Swilling, "Rethinking the sustainability of the South African City",Development Update, 2005.

[13]P.O. Bammeke, "Sustainable Regional Development Planning to Green the Spatial Impact of Urbanisation in Sub-Saharan Africa",Centre for Studies in Technology and Sustainable Development (CSTM), University of Twente, 2013.

[14]K. Williams, "Sustainable Cities: Research and Practice Challenges", International Journal of Urban Sustainable Development, vol.1, nr. 1-2, pp.128-132, 2010.

[15]M. Sundic, &K. Leitner, "Capability for Infrastructure Asset Capacity Management", Digiworld Economic Journal, Vol.89, pp. 55, 2013.

[16]J. Ratas. & S. Maeltsemess, "Role of Environment in Strengthening Competitiveness of Cities by Example of European Green Capitals and Tallin",Tallinn University of Technology, 2013.

[17]C. Constantinescu,"Green economy- an opportunity during the global crisis". Social Economic Debates, Vol 2, nr2, pp. 23-35, 2013.

[18]V.Luzadis, C.Alkire, C.Mater, J.Romm, W. Stewart, L. Will, &D. Vaagen, "Investing in Ecosystems and Communities", Journal of Sustainable Forestry, Vol 12, nr. 3-4, pp.169-194, 2001.

[19]State of African Cities, Re-imagining Sustainable Urban Transitions,UN Habitat,United Nations, Human Settlements Programme, Nairobi, Kenya, 2014.

[20]H. Phimphanthavong, "The Determinants of Sustainable Development in Laos", International Journal of Academic Research in Management, Vol. 3, nr.1, pp.51-75, 2014.

[21]E.G. Too, "Crowdsourcing as an Innovation Strategy"' International Journal of Strategic Property Management, vol.15, nr.2, pp.139-151, 2011.

[22]S.H.Baker, "Project Finance and Sustainable Development in the Global South",InternationalEnvironmental Law: Perspectives from the Global South, Cambridge University Press, 2014.

[23]N. Lindenberg, "Public Instruments to Leverage Private Capital for Green Investments in Developing Countries",German Development Institute, Discussion Paper 4,German Development Institute, Bonn, 2014.

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